AN ABSTRACT OF THE THESIS OF

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For gender-related information, previous studies have shown that children of preschool age are more likely to remember schema-consistent information over schema-inconsistent information. In this study, an attempt was made to boost children's recognition for inconsistent information. In order to do this, children were presented with pictures of both gender-consistent and inconsistent content. Group one was presented with the pictures and an accompanying label. For group two, children were given a label and asked to describe only the pictures where an actor was performing counter-schematic behavior. The postulated mechanism responsible for the expected change in memory for group two involved an augmentation of the schematic structure. The children's description would encourage schematic growth, and the memory benefits that are derived from schematic organization would have been the result. Group three was added to test for the memory changes that may occur when describing consistent information as well. These children were asked to describe both consistent and inconsistent information. Overall results indicated that for children not describing the stimuli, previous research went unsupported and children did not have a better memory for either type of information. Children in group two also did not have a memory preference for either type of information. Children in the third group which described both inconsistent and consistent information, though, did have a memory

preference for consistent information. The results are described in terms of social change and schematic complexity, and their effects on memory.

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Boosting the Preschooler Memory for Schema-Inconsistent, Gender-Based Information

by

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Charles W. Forbes III, Author

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Introduction: The Schema

Schemas organize information in order to help us make sense of our environment. They are the interpretations and expectations which guide perception, memory and decision making (Hastie, 1981). Schemas can take a variety of forms, and can be used to describe rules, concepts, the self, individuals, events, and social roles (Fiske & Taylor, 1991; Hastie, 1981; Taylor & Crocker, 1981). Despite this diversity, these schemas do have a common characteristic: Specificity.

When processing information, humans do not make identical copies of the environment. There is simply too much information to absorb. Instead, we attend to elements that are relevant to what we are doing, and store those pieces for later use (Hastie, 1981; Taylor & Crocker, 1981). Normally, information that is consistent with the expectations of the activated schema is that which is noticed (Hastie, 1981). For example, a person is looking for their eye glasses. It is not until after about five minutes of searching that they realize that they are wearing them. Although absent-minded, this makes sense because the glasses were in a location that they normally do not look for them. Their whereabouts weren't in the looking-for-my-glasses schema. As a result of the activated schema, obvious environmental characteristics were overlooked. This type of guided, environmental search is key to the efficient and purposeful function of information processing within the schema.

The schema is also responsible for the ease of storage for congruent information (Hastie, 1981). This occurs through a contextualization process. When something fits into the predefined terms of the schematic model, the schema has an easier time recognizing and interpreting that information. This

is referred to as "chunking" and can involve large amounts of information (Taylor & Crocker, 1981). Inconsistent information, on the other hand, is defined as not being anticipated by the schema. Because it may not register in the mind, it has a more difficult time becoming a memory. Even when the information is noticed, storage without the supporting schematic framework is problematic. Inconsistent information suffers both a lack of attention and active thought as a result (Liben & Signorella, 1993).

When it does receive sufficient attention, though, inconsistent information can be better remembered. This is thought to be due to the cognitive processes that ensue. When something is identified to be inconsistent with one's beliefs, a reconciliation is required. What occurs is an active, justification process which solidifies the inconsistency as a new memory within the thinker (Hastie, 1981; Taylor & Crocker, 1981).

During this thinking process, a new cognitive network is being constructed. The thinker, by taking an active, interpretive approach, causes a representation of the counter-stereotypic information to form, i.e. a new schema. This new structure then becomes useful during memory recall through its accessible schematic nature. In this way, one's memory becomes altered and can now attend to previously overlooked information.

Inconsistent information can either be something that is in opposition to an entrenched schema, or a new element to add to a pre-existing understanding. When new information in considered contrary to the gist of a currently held schema, though, it may be incorporated in a slightly different way. There is some support for the existence of counter-schematic elements as subcategories within the greater schema itself (Fiske & Taylor, 1991). However, they are characterized as describing isolated case scenarios and do not act as disconfirming evidence for the schema itself.

The following study will attempt to induce this schema enhancing thought process in the child. Research investigating children's memory performance

and the memory boosting effects of a process known as labeling will be reviewed. There will also be a focus on gender-related memory studies.

Gender Schemas

Children's gender schemas, a means of understanding the world in terms of gender (Bem, 1981), are also susceptible to the filtering effects of the schema. Research bears out three very interesting properties of these gender schemas in relation to memory. First, children have a better memory for information that is consistent with their gender schema, as opposed to inconsistent information (Liben & Signorella, 1993; Martin & Halverson, 1983; Ruble & Stangor, 1986). This effect is exaggerated in children who are more gender schematized than others (Bem, 1981; Hort, Leinbach, & Fagot, 1991: Signorella & Liben; 1984), especially in younger children (Levy, 1989). Second, children are more likely to transform gender inconsistent information into gender consistent information during memory recall (Levy, 1989; Martin & Halverson, 1983; Ruble & Stangor, 1986). Thirdly, children have better memory for gender consistent information when it corresponds with their own sex (Levy & Boston, 1994; Koblinsky, Cruse, & Sugawara, 1978, Ruble & Stangor, 1986).

The reasoning for these three occurrences follows respectively. First, a better memory for schema-consistent information stems from the organizational properties of the schema itself. Consistent information, by definition, is that which is included in the schematic structure. Because the framework is set up to expect consistent information, anything perceptually synonymous in the environment will be more easily recognized and interpreted. Alternately, as it has no preorganization, inconsistent information is either not attended to, is not encoded as efficiently, or is not stored as

effectively, and thus suffers a deficit during memory recall (Liben & Signorella, 1993; Taylor & Crocker, 1981).

The gender transformation error occurs when recalled information is different from the stimuli that was actually presented. This would be the case when a child remembers a male firefighter coming to his or her class, when that person had actually been a female. This inaccuracy is attributed to either of two processes. The first involves an initial perceptual deficit and the subsequent insertion of faulty information into an incomplete memory. These memory distortions are the result of the schema's lack of efficacy when recording information. It ends up that gender is not registered during the encoding process. When the time comes for recall, gender must be inferred, and the practical substitute inserted into the memory turns out to be different from the original which actually occurred. These errors are more likely to occur in the direction which favors a gender schema-consistent role (Levy, 1989).

A second reasoning implicates the child's desire for order and sense in the world. A motivational factor exists which propels the child towards impressions that are consistent with social norms (Ruble & Stangor, 1986). During recall, an intact memory may be changed in order to match the child's perception of how the world is supposed to be.

For the third memory effect, a better memory for gender consistent information when it corresponds to the sex of the subject, one must understand the self-schema. A self-schema is a definition of one's own person. This self-definition is organized in terms of concepts people find to be true about themselves. These may differ in nature developmentally, such as the younger child seeing him/herself in more concrete terms (Ruble & Stangor, 1986). They all include, however, the element of self-definition. In the social setting, these self-schemas may help us interpret others' behavior. Characteristics that one discovers in themselves, are those which they look for in others (Fiske & Taylor, 1991). Therefore, memory effect number three

occurs: Children's use of gender-constrained traits in their own self-schemas allow them to detect similar features in others of the same sex.

Many of these effects have been found with children who span the age range from kindergarten to 4th grade. The preschooler's memory also appears to behave similarly. Levy (1989) and Boston and Levy (1991) found that younger children have a better memory for gender consistent information, as well as make more gender transformation errors. In the same study, Boston and Levy (1991) also found that preschoolers were better able to recall stimuli corresponding to their own biological sex.

The gender schema is utilized in this study because of its well researched background. It's use, though, does question the consequences of changing gender schemas in children. Are gender schemas necessary for interpreting the environment? There is evidence that gender-schemas are developmental in nature. They emerge as early as two-years of age (Kuhn, Nash, & Brucken, 1978) and change systematically across early childhood into adolescence (Ruble & Stangor, 1986; Serbin, Powlishta, & Gulko, 1993). Adults expect gender-typed behavior of both boys and girls (Johnson & Workman, 1993). Peer acceptance may also be affected by sex-typed behaviors. Children ages four to ten had a lower liking for boys with female-stereotyped characteristics and girls with male-stereotyped attributes (Martin, 1989). Further, children have been shown to prefer other children with gender-stereotyped attributes similar to their own (Zucker, Wilson-Smith, Kurita, & Stern, 1995). These effects may be more intense for males' social development, though. One study found that only boys' use of male-stereotyped behaviors are related to their own perceived physical competence and peer acceptance (Cramer & Skidd, 1992). Also, males with feminine characteristics are perceived differently than females with male characteristics (Martin, 1995).

There is a competing body of research that displays positive outcomes for children with both same and opposite sex-typed gender schemas. These

personality types are referred to as androgenous. Androgenous children display a higher self-esteem, are better liked, and are better adjusted than their traditionally sex-typed peers (Allgood-Merten & Stockard, 1991; Boldizar, 1991; Massad, 1981). Androgenous people are also better able to adapt to new situations by adjusting their behavior to situational demands (Shaffer, Pegalis, & Cornell, 1992). What these combined findings convey is that there are no definitive positive or negative consequences when dismantling gender schemas. What is apparent is that research which does tamper with these sensitive issues should move forward at a cautious pace.

Effects of Labeling

The question now turns towards methods of increasing children's memory for gender-inconsistent information. Research investigating the process of labeling in children lends some promise to this attempt. In the process of labeling, a name or description is supplied in association with a stimulus. For example, the subject is presented with a picture of a man chopping wood. The experimenter would provide the label "a man chopping some wood" with the drawing. Purportedly, this boosts memory by alerting a schema into activation, or by offering a ready-made interpretation when none exists for the child. Interestingly, recall for inconsistent information becomes boosted by this attempt. Recall for consistent information, however, also improves (Levy, 1989; Liben & Signorella, 1993). The end result is a maintenance of the same relative proportion of memories, with consistent information being better remembered than gender inconsistent information.

Verbalization and the Effects on Memory

Of interest, children in the studies mentioned above were supplied with stimulus labels generated by the researchers. Perhaps, though, if subjects were allowed to create their own labeling or description for inconsistent information, a more pronounced outcome might occur. Remember, improvements in memory for counter-stereotypical information may be the result of thought (Fiske & Taylor, 1991). This process would be different from labeling, as schematic structures would be created, and not just cued. This would allow for further improvements in memory recognition for otherwise difficult to recall information.

Studies which investigate the effects of children's verbalizations lend evidence towards this approach. It appears that children who are encouraged to verbalize by adults have a better memory for content information (Price, 1984; Price, Hess, & Dickson, 1981). The idea follows that verbalizations allow for memory structures to develop in long term memory stores. By changing one's knowledge base in this manner, incoming information can be dealt with in a new way. This means that once unfamiliar items may be more easily comprehended, and their recall may also be facilitated (Price, Hess, & Dickson, 1981). The means by which parents invited their children's verbalizations in these studies were through questions, requests, and demands. A similar enhancement of memory may be possible if subjects in this study are allowed to create their own description for inconsistent information.

For this thesis, preschool-age children will be asked to generate their own descriptions for gender inconsistent behavior. It is hypothesized that this will induce a better memory for inconsistent information. The mechanism responsible for this heightened recall will be the newly created schema itself and it's simple schematic characteristic of enhanced recall.

Method

Subjects

The children used in this study were enrolled at the Oregon State University Child Development Center. There were 82 children attending the program, 32 of which whose families income falls below the poverty line set by the state of Oregon. The children's ages ranged from 3 years 3 months, to 5 years 7 months, with 46 boys and 36 girls attending. In the study itself, 54 children were successfully tested, with 27 boys and 27 girls. All loss of subjects was attributed to a lack of parental permission (13.9%), a lack of the child's permission (11.3%), and the experimenter's decision that a child was unable to complete the study in it's current delivery (3.8%). Another descriptor, language spoken in the home, was also collected. For this sample, 9.3% of the families spoke Spanish, 3.7% spoke Hamaric, 3.7% spoke Chinese, and 1.8% spoke Hindi.

The Hollingshead Four Factor Index was used in order to determine the socioeconomic status of the sample. According to this measure, families can achieve scores ranging from 0 - 66. In this study, six categories were arbitrarily created from this scale at 11 point intervals. Also, two additional groups were introduced, as their scores couldn't be created according to the Hollinghead's criteria. These groups are: families whose parents are students, and families whose parents are unemployed (see table 1).

<66	<55	<44	<33	<22	<11	unem	student
23	5	4	2	7	0	4	7

Table 1. Socioeconomic status of sample

Materials

Children were divided into three groups and involved in three separate sessions. In the first session, all children were assessed for their gender schemasticity (see Appendix C for stimuli). This is the degree to which some children will rely upon their gender stereotypes during perception. Children with higher scores are more likely to process information in terms of gender (Bem, 1981; Hort, Leinbach, & Fagot, 1991: Signorella & Liben; 1984). Each child was presented with 20 gender-typed objects from the SERLI (Edelbrock & Sugawara, 1978). They were asked, "Who would use a _____, boys? girls? or both boys and girls? The child then placed the picture in the appropriate box in front of them. The pictures were randomized before presentation for each child.

At least one day later, session two involved the presentation of gender-typed activity pictures with either male or female models. Example behaviors include an actor sewing, doing dishes, and using tools. All three groups were presented with pictures of men and boys doing typical male activities, and typical female activities. They were also shown pictures of women and girls doing typical female activities, and typical male activities (see Appendix A). For all groups, every picture presentation was associated with an experimenter-generated label. For group one, children were presented with

the pictures and their label. For group two, all pictures were presented with a label, yet only inconsistent drawings were associated with the question, "What can you tell me about this picture?" For group three, all pictures were presented with a label, with both consistent and inconsistent drawings being associated with the same question, "What can you tell me about this picture?"

The stimuli for session two were black and white line drawings taken from the SERLI (Edelbrock & Sugawara, 1978). There were eight pictures with counter-stereotypic content, four displaying a male model and four with a female model. There were also eight pictures with stereotypic content, four displaying a male model and four with a female model. Each picture was presented for five seconds with an immediately offered label. If a description was needed, it was asked for prior to the presentation and this 5 second period. The picture was then removed from sight. Children in the description groups were allowed up to 30 seconds to deliver a response. Four pictures that were free from gender content were shown before the experimental presentations, and four pictures after. This helped ensure that later memory recall for the testing items was not the result of primacy or recency (Greene, 1992; Wyer & Srull, 1989).

During the third session, children were given a memory recognition test. This occurred after a one day interim. At this point, children were presented with the 16 pictures that had been shown to them at time 2, as well as sixteen that were not. These were presented on four posters featuring eight images each (16 target + 16 distracters / 4). Each poster contained two consistent and two inconsistent behaviors seen in the previous test situation, as well as four never before seen pictures. The distracter items were also taken from the SERLI, and are identical to the 16 original stimuli in the activity portrayed, except that they will contain an actor of the opposite gender (see Appendix B). The children were asked to point to those pictures which they have seen

before. All correct responses (hits) and incorrect responses (false alarms) were recorded.

Pilot Testing

A pilot test was initially run with eight subjects ranging in age from 3 years 3 months to 5 years 5 months, with 5 girls and 3 boys. There was a question as to whether or not the stimuli should be presented for three or five seconds. Also of concern was whether or not the time lag between time 2 and time 3 should be one day or seven days. Results from these children guided this research project towards using a 5 second presentation period, with a one day wait before the recognition phase.

Statistical Analysis

Socioeconomic status for the subjects was measured by the Hollingshead, and then controlled for through matching. Following the matching process, children were randomly assigned to one of the three groups.

A General Linear Model with repeated measures was used to test all hypotheses. The first GLM examined the differences between group one and group three. It was set up in a 2X2 design, with gender-consistency/ inconsistency of the information as the repeated measure. The between groups variable considered whether or not the child described the information. A GLM design was chosen for this analysis because of it's ability to statistically control for additional covariates. For this study, those variables were gender schemasticity, gender, and age (see tables 2, 3, & 4 for the descriptive statistics on these variables). There was no difference between groups on the basis of their covariate values (see table 5). In addition, none

of the covariates were significant in the initial results except for age in the group one X two comparison (see table 6). Therefore, age was the only covariate included in all subsequent analyses.

The second GLM examined the differences between group one and group two. The repeated measure was the gender consistency of the stimuli. The between subjects variable was again group membership. Age was entered as a covariate.

	males	females	total n
Group 1	7	14	21
Group 2	10	7	17
Group 3	10	6	16

Table 2. Gender distribution of the sample

	n	min.	max.	mean	std. dev.
Group 1	21	0	20	8.7	4.29
Group 2	17	0	20	9.4	5.67
Group 3	16	0	13	6.5	3.29

Table 3. Gender schemasticity scores of the sample

	n	min.	max.	mean	std. dev.
Group 1	21	3.42	5.25	4.21	.61
Group 2	17	3.25	5.58	4.44	.78
Group 3	16	3.42	5.25	4.32	.59

Table 4. Age range and means of sample

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	.46	2	.23	.53	.59
	Within Groups	22.29	51	.44		
	Total	22.76	53			
Gender	Between Groups	.97	2	.48	1.96	.15
	Within Groups	12.53	51	.24		
	Total	13.5	53			
Schem	Between Groups	74.78	2	37.39	1.82	.17
	Within Groups	1044.94	51	20.49		
	Total	1119.72	53			

Table 5. ANOVA testing for differences between groups for covariates

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6.36	1	6.38	2.51	.12
AGE	9.94	1	9.94	3.91	.05
GENDER	.58	1	.58	.23	.64
SCHEM	5.43	1	5.43	2.14	.15
GROUP	1.22	1	1.22	.48	.49
Error	83.8	33	2.54		

Table 6. Test for significance of covariates, group one X two analysis

Hypotheses

Group one X three analysis

1. Group three will remember more overall information than group one
2. Both groups will remember more gender-consistent information than gender-inconsistent information

Group one X two analysis

3. An interaction effect: children in group one will remember more gender-consistent information than inconsistent, while group two will remember equivalent amounts of both types of information.

The reason why three groups were needed in this study involves both statistical soundness and actual research goals. To make this easier to understand, all three groups have been defined again below.

G1: doesn't describe any information (group 1)
G2: describe inconsistent information only (group 2)
G3: describes all information (group 3)

The initial research goals involved only boosting children's recall for inconsistent information. Research shows that children's recall for stereotype consistent information is better than that for stereotype inconsistent information. The goal of this project was to increase the relative recall of inconsistent information when compared to consistent information. The net result would be something similar to: The number of inconsistent items recalled would be the same or greater than the number of consistent items recalled. This hypothesis is testable by comparing G1 to G2. You could not infer this by comparing G1 to G3. So why create this third group?

The reason involved the design of past research in this area, especially a study by Levy, after which this project is closely modeled. Levy was looking at whether or not labeling improved children's level of recall. He theorized that labeling jump-started the schema into activation and made the memorization of information easier. He had two groups, label/no label X consistent/inconsistent information, a 2 X 2 design. It was believed that by following the model of a previous study, this project would be stronger. This is especially true since this study already closely follows the set-up of Levy's. Also, by allowing the results of the G1 X G3 analysis into the project, we would be learning an additional piece of information: Does describing alone boost memory for both types of information?

The third group was added so that this study would appeal to two groups of thought. One camp would be interested in the degenderization of children's memory and stereotypic development. These people would be interested in comparing G1 and G2. Can an intervention involving counter-stereotypic information lessen the dominance in memory that stereotype-consistent information holds? The other crowd would be those interested in the model the project is using. They wouldn't be surprised by any memory effects resulting from description. They would think that the process of verbalization itself boosts memory, and that this is where the importance of the project lies. They are interested in comparing G1 and G3.

Dependent Variable

The dependent variable in this study was initially a measure of children's recognition memory appearing in Levy (1989). However, there were problems with this measure. Scores from this measure were described as ranging from +.5 to -.5, with positive values denoting a higher hit rate relative to the false alarm rate. When run with this study's data, scores were capable of ranging

from +.5 to -1. It was necessary to find a replacement measure which still incorporated hit and false alarm rates, but behaved in a more consistent manner.

After investigating signal detection theory, a reasonable measure was located. Here is a short background on that measure, Ag:

$$Ag = \frac{\text{probability (hit)} + (1 - \text{probability (false alarm)})}{2}$$

An ROC (receiver operating characteristic) curve defines the relationship between false alarm and hit rates for a set of data. The ROC curve is assumed to have one end point where the FA rate is zero, and another where the hit rate is one. It is also assumed to be a monotonically increasing function with a non-increasing slope (Craig, 1979).

Ag is a measurement of the area beneath this ROC curve, and it supplies a description of memory accuracy. Higher values of Ag indicate an ROC curve with a steeper slope. This translates into higher hit rates in proportion to false alarms. So, subjects with higher Ag scores are more accurate in their memory for previously viewed information. Lower scores are related to ROC curves with a less steep slope, and thus, poorer memory. This measure was also useful because it is considered to be nonparametric. A later discussion will illustrate clear concerns about the normality of the data collected in this study (also see figures 9 & 10).

A different measure, however, was actually used to analyze the data:

MA (memory accuracy) = # of hits - # of false alarms

There were two reasons for this decision. One, MA correlated perfectly with the value Ag. Two, it offers a simplified understanding of children's memory

scores. Positive scores are associated with better memories for target information. And, the greater the score, the more accurate the memory.

In order to test the hypotheses of this thesis, two scores were actually collected for each child. MAc was a measure of children's recognition memory for consistent information. MAi was a measure of children's recognition memory for gender-inconsistent pictures. Listed by group, data distributions for the measures MAc and MAi are represented by histograms in figures one and two.

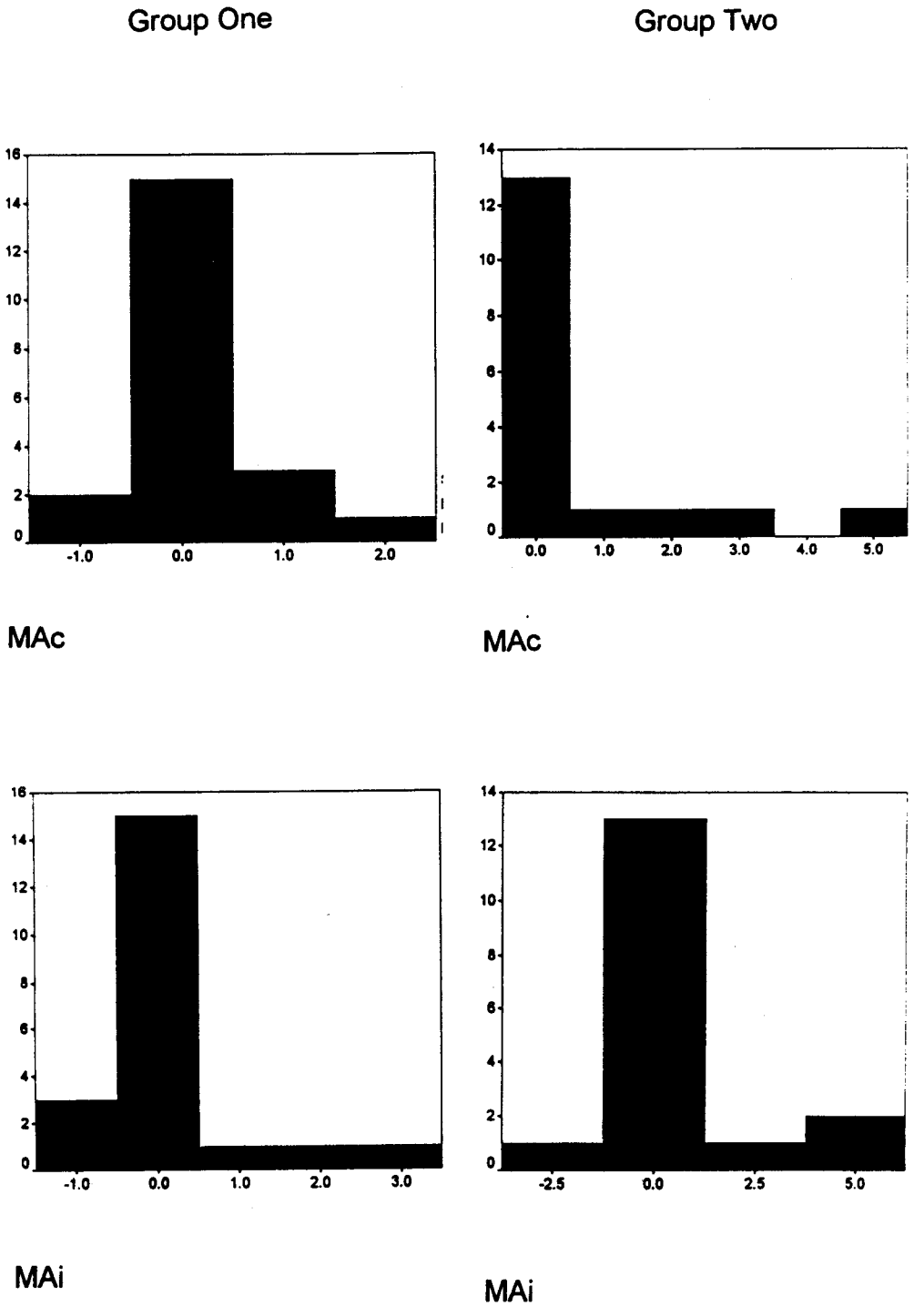
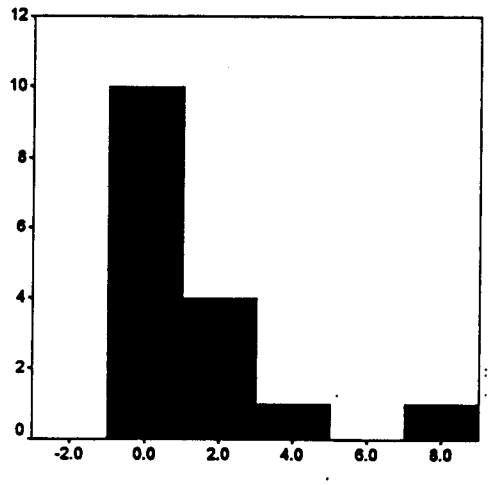
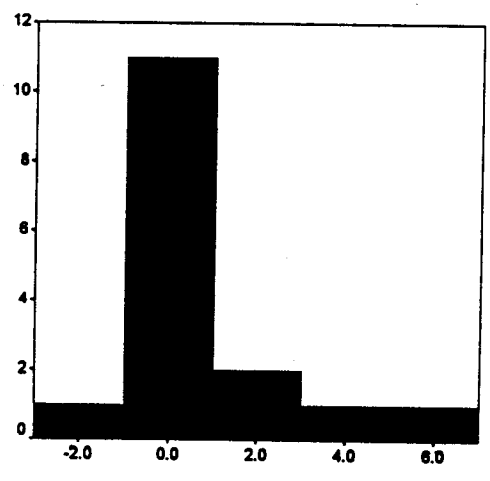


Figure 1. Distribution of sample data for groups one and two

Group Three



MAc



MAi

Figure 2. Distribution of sample data for group three

Results

Group 1 and Group 3

	group one (n=21) / std. dev.		group three (n=16) / std. dev	
MA for consistent information (MAc)	.14	.65	.93	1.98
MA for inconsistent information (MAi)	.14	.91	.43	1.82

Table 7. Children's mean recognition memory scores

A general linear model allowing for repeated measures was used to examine differences in memory accuracy according to whether or not children described the information presented to them. Age was included as a covariate in the analysis, and was found to be insignificantly related to memory accuracy ($F < 2.074$, ns). The main effect for the consistency of information was marginally significant, $F(1,32) = 3.812$, $p < .059$, but for group affiliation was insignificant ($F < 1.253$, ns). There was a significant group X consistency interaction. $F(1,32) = 4.407$, $p < .043$.

These results indicate that children's memory for gender consistent and inconsistent information is variable. Children's memory accuracy for consistent information is greater only when they are asked to describe both types of information.

Group 1 and Group 2

	group one (n=21) / std. dev.		group two (n=16) / std. dev	
MA for consistent information (Mac)	.14	.65	.64	1.41
MA for inconsistent information (MAi)	.14	.91	.58	1.93

Table 8. Children's mean recognition memory scores

A general linear model-repeated measures was also used to examine the differences between group one and group two. There was no significant main effect for gender-consistency of the information ($F < .884$, ns), or for group ($F < .890$, ns). There was a main effect, however, for the covariate age $F(1,35) = 4.086$, $p < .051$.

If the original hypotheses had been supported, a significant interaction effect would have been present as well. The effect would have demonstrated that memory for consistent information was better than that for inconsistent information, but only for group one. For group two this effect would not have been the case. There was no significant interaction effect ($F < .109$, ns).

A regression analysis was performed on the data to estimate the effect of age on the overall memory performance of the children.

	b	Std. Error	t	p
GROUP	.70	.74	.94	.35
AGE	1.10	.54	2.02	.05

Table 9. Group and age regressed against overall memory scores

There are a couple of numerical interpretations for this b value. The basic analysis reveals that for every one unit increase in age there is a commensurate 1.103 unit rise in overall MA scores. This increase can be the result of either of two processes. With increases in age, children either increase their number of hits, or decrease their number of false alarms. It is possible that these two processes are qualitatively different. Unfortunately, this analysis is unable to detect which of the two, or if both processes, are occurring.

Discussion

Group 1 and Group 3

The pattern of interaction found between groups one and three was unexpected. The original hypothesis predicted similar outcomes for both groups, with gender-consistent information being better remembered than inconsistent information. The fact that the anticipated outcome was present for only group three requires some explanation.

Starting with group one, children remembered equivalent amounts of consistent and inconsistent information. This contradicts previous findings (Levy, 1989; Liben & Signorella, 1993), where labels were also offered during the stimulus presentation. Were the children in this study thinking differently? Possibly. Remembering back, a better memory for gender-consistent information was predicted here because children were thought to have schemas for that information. Because children remembered both types of information equally as well, it is reasonable to think that children may have separate schemas available to process either consistent or inconsistent information. Earlier cited, Fiske & Taylor (1991) mention that counter-schematic structures may even exist within other schemas. These internal schemas do not act as disconfirming evidence for the larger schemas, though. They exist to explain counter-specific examples as isolated case scenarios.

In order to have obtained these dual schemas, the children in this study may have been exposed to a cultural shift in the curriculum of gender. Exposure to new interpretations of gender from parents, teachers, and perhaps even peers, may be altering the schematic content of these children's minds. Alerting children to the presence of women performing typical male

duties and vice versa, for example, may be providing children with a new means of perceiving the world.

If this can be assumed to be true, then why did the children in group three revert back to the predicted memory pattern? These children differed from those in group one only in the fact that they were asked during each picture, "What can you tell me about this picture?" This request for description appears to be associated with a qualitative change in the way children think.

Schemas can vary in the amount of information that they contain, and they become more complex as they develop (Davies, 1994; Fiske & Taylor, 1991). It is this complexity that may have accounted for the children's change in thinking. The assumption was made above that children may now have schemas for both gender-consistent and inconsistent information. These two schemas may vary, though, in their content. Schemas with gender-consistent content may be richer and contain more examples than those for inconsistent information. In fact, the inconsistent schemas may only be sub-schemas within the consistent schemas themselves (Fiske & Taylor, 1991).

When children are asked to remember gender-based stimuli, they can activate the appropriate schema based upon the consistency or inconsistency of the information. This was evidenced by group one's performance, with children remembering both types of information equally as well. When children are asked to describe the information, however, a different process takes place. A deeper type of processing is possibly occurring, and the schema is searched more thoroughly during the encoding stage. The stimuli which are supported by the more diverse schemas have more connections through which a memory can be later evoked. This results in the increased likelihood of consistent recall as seen in group three.

Under these terms, the gender-consistent schema is more insidious than originally thought. At first glance, there appears to be a division of power between consistent and inconsistent schemas. When information is more ardently processed, however, the focus of the perceptual system can change.

The ability of children to have two separate beliefs about the same topic is somewhat upheld by a study looking at children's play preferences. Lynn, Eisenbud, and Rose (1995) exposed children to neutral, non-sex-typed toys. Experimenters then applied a gender label to the toys. Children declared the toys to be appropriate for themselves and/or others who had the same gender as the label. Later in the experiment, more attractive toys were presented with opposite-sexed gender labels. Although children rated these toys less desirable, they did like them as much as the less attractive same-sex labeled toys. In this case, children have both a gender-appropriate schema and a "toys-I-like-to-play-with" schema.

Children's reaction to the attractive toy without a gender label is intended to denote desire for that toy, hence its attractiveness. With the added element of gender-appropriateness, though, a competing schema arises. According to some rule, children are making choices about which schema to follow. Although more emotionally charged, this process is similar to the one explained above. This is a case where two schemas are activated, but one bears more salience to the situation. Even though these children are recognizing the gender appropriateness of the toy, they still choose to play with it. The decisions for the children in Lynn, et. al. (1997) and those in this thesis rests in the degree to which competing schemas are activated, and the prevailing utility of the more descriptive schema.

Group 1 and Group 2

For the analysis between groups one and two, an interaction effect was anticipated. Memory for consistent information was predicted to be greater than that for inconsistent information in group one, but not for group two. This outcome was argued to be the result of the treatment for group two. When presented with gender inconsistent pictures, these children were asked,

"What can you tell me about this picture." Without also having this request during the presentation of the consistent information, it was believed that there would no longer be a memory preference for the gender-consistent pictures. It turns out that there was no significant interaction effect.

This outcome can also be understood in terms of the interpretations given above. Information that is investigated more deeply, only has an increased chance of recall if the activated schema itself has an increased depth and complexity. For group two, the gender-inconsistent pictures were investigated more intensely. Their resulting schemas, though, were less detailed. The memory benefits we previously saw for consistent information were not possible for the inconsistent information presented to group two. Therefore, children's memory for both gender-consistent and inconsistent information was similar.

These results seem to support the psychological nature and fluidity of the gender role, as children in this study were not subject to the memory biases in previous studies (Liben & Signorella, 1993; Martin & Halverson, 1983; Ruble & Stangor, 1986) Behavior, by these terms, is not constrained by gender, but rather defines it. To take a symbolic interactionist perspective (LaRossa & Reitzes, 1993), gender roles are now being renegotiated in our culture. Perhaps during this conversion process, we are required to maintain a dual interpretation of the world. On one hand, it is okay for women to perform stereotypically male duties. On the other hand, it is more likely for the person to associate men with that same activity. At first glance, this may seem problematic. The positive side is realized when children are capable of remembering both types of information, both gender-consistent and inconsistent. Their perceptual sensitivity is increased and their impression of their environment is in turn, more accurate.

Limitations

A frequency analysis of the raw data in this study alludes to a problem. Over half of the children tested (n = 36) responded with eight hits as well as eight false alarms. In terms of their recognition memory score, this is equal to zero. Because so many subjects responded in this manner, the distribution of scores is not normal. The statistical outcomes of the GLM's in this study should therefore be suspect. To try and make sense of this memory effect, though, a variety of explanations have been generated. There is a question, also, as to whether or not MA is actually a memory score under these conditions. Perhaps the dependent variable was actually a measure of children's desire to please the researcher. On the other hand, MA may be a memory score if children were focusing on the activity of the actor. Assuming this to be true, children were scoring perfectly. It is the perspective of the researcher that for most children, though, Memory Accuracy was not a measure of children's memory for the gender of the actor in the drawings.

When a subject is in a situation where a correct response is asked of them, their perception is important. Their perceived risk of committing an error, as well as the anticipated benefit of providing a correct answer come into play. According to signal detection theory, a conservative response strategy limits the number of false alarms. It also decreases the overall number of hits. Alternately, a more liberal strategy increases both the number of hits and false alarms (Shapiro, 1994).

For this study, children may have utilized the more liberal approach. Depending upon the child, they might have seen the detriment of answering incorrectly to be quite small. Another scenario depicts the child committing errors because of their ambitious attempts to answer everything correctly. There might also have been the child who utilized both strategies

simultaneously. Either of these strategies or the both combined could have led to the memory errors seen here.

An alternative explanation is a bit simpler. During the recognition phase of the project, children were asked to point to any pictures that they had seen before. After each picture was selected, the experimenter placed a star in the bottom right corner of that picture as a memory marker. This process was selected for its interest value to the child and its possible ability to defend against inhibition. As mentioned by an observer, this could have had an unintended effect. The children who achieved memory scores of zero could have merely enjoyed having a star applied to every picture. Even though this possible outcome was anticipated in the beginning, it was thought that the researcher's application of the stars, and not the child's, would have removed this effect.

A child's perception of difference also may have played a role in this study. The pictures presented at time 1 and the foils introduced at time 2 differed only in the sex of the actor. In order for children to choose one picture over another, they would have to be able to distinguish between the two. Following the recognition task, children scoring an MA of zero were questioned as to whether or not they could tell the difference between the pictures.

First, children were alerted to the fact that two similar pictures were present in the array. They were than asked if the two pictures were the same or different. Interestingly, most of the children noted that the pictures were different. When asked why they were different, the children mentioned that in one picture there was a man and in the other, a woman. Some children did, however, believe that the pictures were the same (n = 11). For most of these children, their focus was on the activity of the actor in the picture. For example, when children were asked why the pictures were the same, they would mention that both people were feeding the baby, or that both were chopping wood, etc.

The potential lies here for the further investigation of children's memory ties to people's behavior and not their gender. This is especially interesting when you consider that there were no significant findings in terms of the gender-consistency of the information in this study for group one. As stated before, perhaps we are looking at a shift in children's developmental course due a degenderizing curriculum in our culture. Alternately, the explanation may be less extreme than a change in our cultural perspective. Some children may simply process the world in a qualitatively different manner, with a focus upon the action and not the actor.

There still lies the task of describing the poor performance of children who were able to tell the difference between the pictures. A likely reason for these children's unusual memory scores deals with their developmental understanding of memory. Children with less accurate memories would need to understand some aspects of thought in order to successfully complete the memory task in this study. To substitute for their inaccurate recognition, they would need to problem solve for an answer. If they were unsure about which pictures they had seen, they would need to come up with a method for choosing.

Memory has basic developmental characteristics and improves over time. These changes may be the result of improvements in the mechanics of the brain, the learning of memory strategies, and/or the development of metacognition. Metacognition, defined simply as knowing how thinking works (Siegler, 1991), is probably affecting children's performance in the memory task used in this experiment. This is not surprising as children have been shown not to have accurate impressions of their mind's capabilities (Kreutzer, Leonard, & Flavell, 1975). Their knowledge of the mind has yet to realize its inherent limitations, and so they either lack in knowledge or have incorrect assumptions about its abilities. The children in this study have probably not achieved the proper understanding of memory in order to participate successfully. In other words, the task was too hard for this age group. This

level of difficulty was probably compounded by the fact that the line drawings were not colored, and were somewhat uninteresting in their simplistic drawing style. This may have generated a lack of interest in each picture, making recognition that much more difficult.

The metacognitive strategy that children would need in this study involves the knowledge that only items that have been seen are those that can be remembered. Before using this understanding, though, children would first need to notice the difference between two pictures which varied only by the gender of the actor. As mentioned above, most children were capable of doing this. Next, they would need to choose one picture over the other. In order to accomplish this task children would need to know that you can only remember one item if originally presented with one item. Something that may have made this process even more arduous could have been the placement of the pictures. Even though the target pictures and their foils were present on the same memory cards, they were seldom neighboring each other. For some children, this could have made the practice of choosing one of two similar pictures even more difficult.

This is not to say that the children were incapable of choosing one out of two similar pictures. With the experimenter's help, most of the remaining twenty-five children of the thirty-six which scored MA's of zero were able to do so. Through directed guidance and assistance, children are capable of achieving more than could have on their own. It is this assisting role that I would like to turn to next.

The method in this study followed a very strict course in order to treat each child as similarly as possible. Normal human discourse, on the other hand, is very flexible. There are a variety of styles (Welch-Ross, 1997), and even where there are rules there is a process of interaction (Kleifgen, 1990). For this study, the lack of interplay made conversation seem strange and

unnatural. It is believed that this rigid approach towards interaction was the most dehabilitating problem that was encountered.

The studies that inspired the incorporation of children's verbalizations into this project (Price, 1984; Price, Hess, & Dickson, 1981) discussed children's responses to caregiver questions. At the time, there was a crucial element of these conversations that was missed. Caregiver's weren't simply asking a question occasionally. They were elemental in pushing children's cognitive level higher than the children could have accomplished on their own. They weren't asking, "What can you tell me about X." Instead, their questions were much more directed and probing. After one question was answered, the next would require more detail from the child. What was occurring was a learning process.

This study, on the other hand, incorporated a different technique. It was much more like a job interview, with one repeated dead-end question. Children were put into a laboratory situation which had no real-world counterpart. In fact, only three children responded with the fantasy-filled gregariousness that had been originally expected.

Further problems point to the non-verbal aspects of communication. Remember that the picture presentation at time 2 was as follows: Each picture was presented for five seconds and then removed from view. Children were asked a question about a picture, and then it was removed before they could complete their comment. To have left the pictures up longer for group three during their descriptions could have produced a confound for memory improvements. The picture removal, though, looks to have communicated a message to the subjects: All interaction about this picture is over. We are moving on. This resulted in their stoppage of speech, and their readiness for the next picture. This particular process limited children's chances to expound upon what they were seeing, a process thought to be essential in this study.

Another possible difficulty deals with the process of inference in conversation. In group 2, children were only asked to describe inconsistent

be chosen. By doing this, children have a variety of criterion upon which to judge the familiarity of novel pictures against those they have seen before. Younger children probably need this easier format in order to deliver valid memory scores.

Second, the necessary metacognitive strategy for this task could be taught in an initial training phase prior to time 1. During this session, the researcher could attempt to teach the child first how to differentiate between two like pictures. Next, the child could be taught that when only one picture is initially presented, only one can be recalled. They would then have the necessary tools to be run through the experiment. Although this alternative appears more difficult, there was some evidence of marginal success with this technique and the children in this experiment. As stated before, the children who scored a MA of zero were given a similar, cursory training after the recognition phase (time 3). Out of those who could tell the difference between pictures, most children were capable of choosing one out of every two like pictures.

In order for this study to take advantage of the memory benefits from conversation, there could be a move away from the quantitative methodology. This would result in a more flexible approach which tailors itself to the child's interests. Employing a style of discourse similar to that of a mother-child dyad (Welch-Ross, 1997) should yield a different outcome. Also, it makes sense that people will remember information better if they have encoded it in a meaningful context. There could still be some control, though. For example, during picture presentations, interactions could end after a specified time period. Also, there could be two groups. In one group, questions could be asked which only prompted children to talk more. In the other group children could be asked more probing questions which tied into children's previous responses. Alternately, children could be asked only one probe question. Minor changes could include: children could be asked a follow-up to the initial question asked in this study, "What are they going to do with the X?" Children

could be asked a more descriptive question, "Can you make up a story about this man sawing wood? What is he making?" There could be a warm-up process prior to testing which encourages the child to speak and interact. Overall, the intent of these changes would be to tap into the process which makes new information personally meaningful, while creating a reliable copy of the environment.

In order to test for the constraining effect of the label on children's responses, the label should be left out for group 3. When they are compared to group one (label only), children could be shown the picture and asked only, "What can you tell me about this picture." By doing so, children would be able to generate a personal impression of the stimulus material.

The last change would be to exclude group 2 from the experiment until there was a reliable effect found between groups one and three. A confidence in the hypothesized outcome of the group one and three analysis led to the premature addition of group two.

Conclusion

Generalizations of this study to the population of preschool age children in Corvallis, OR, is suspect. This is primarily due to the non-normal distribution of the sample data. The main significance of this study, rather, lies in its investigation of the memory capacities of young children, and the importance of communication during memory acquisition. Indeed, this study is able to present greater insight and chart future directions more so in its failure than its success. If the results do represent a valid finding, though, then an important change is occurring. Gender is losing its salience as a categorical agent of memory. This has implications for self-perception as well as the way we comprehend others. The consequences, if true, should bring increased flexibility in people's chosen actions, but at the cost of the predictability of gender roles.

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Appendices

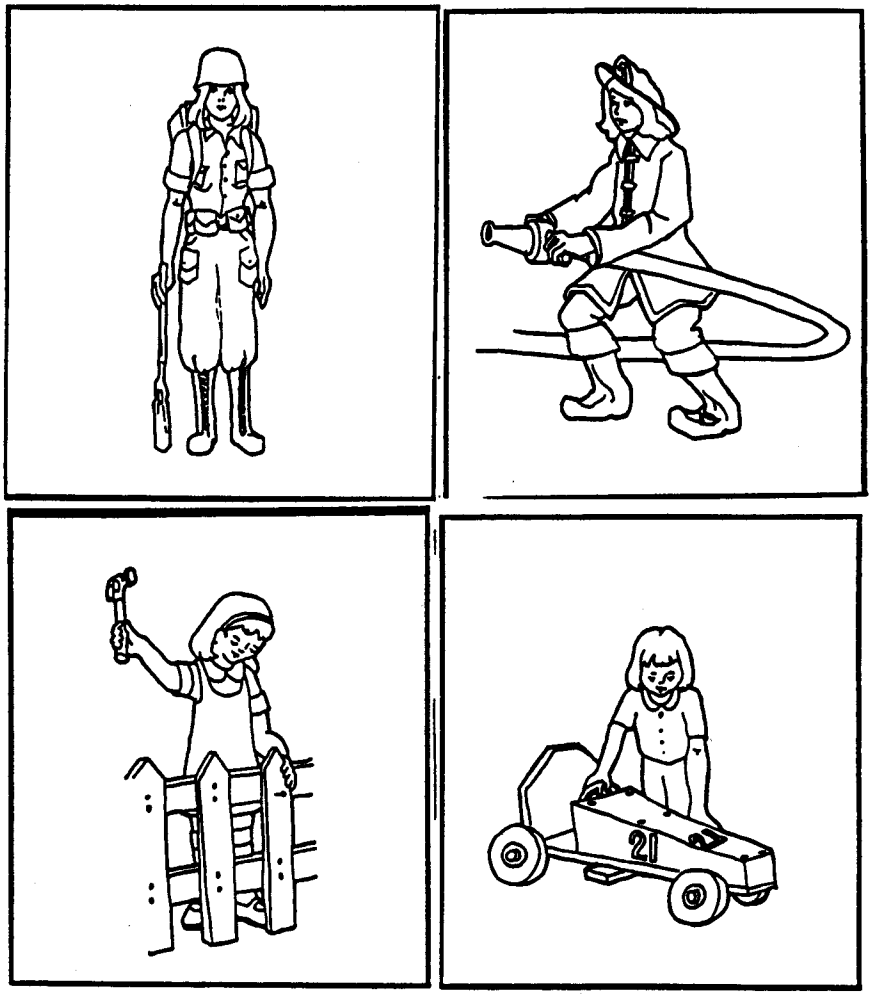
Appendix A

Target Pictures

Target Pictures:
Gender-Consistent Content


2
+2
4

Target Pictures:
Gender-Inconsistent Content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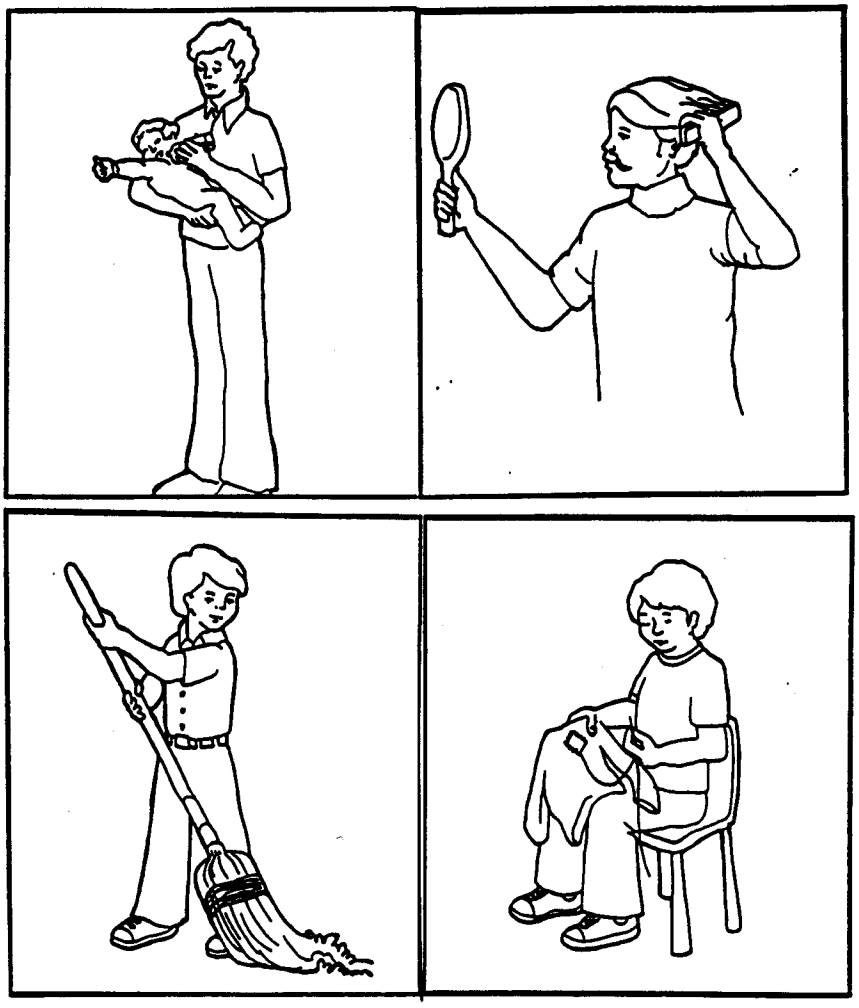
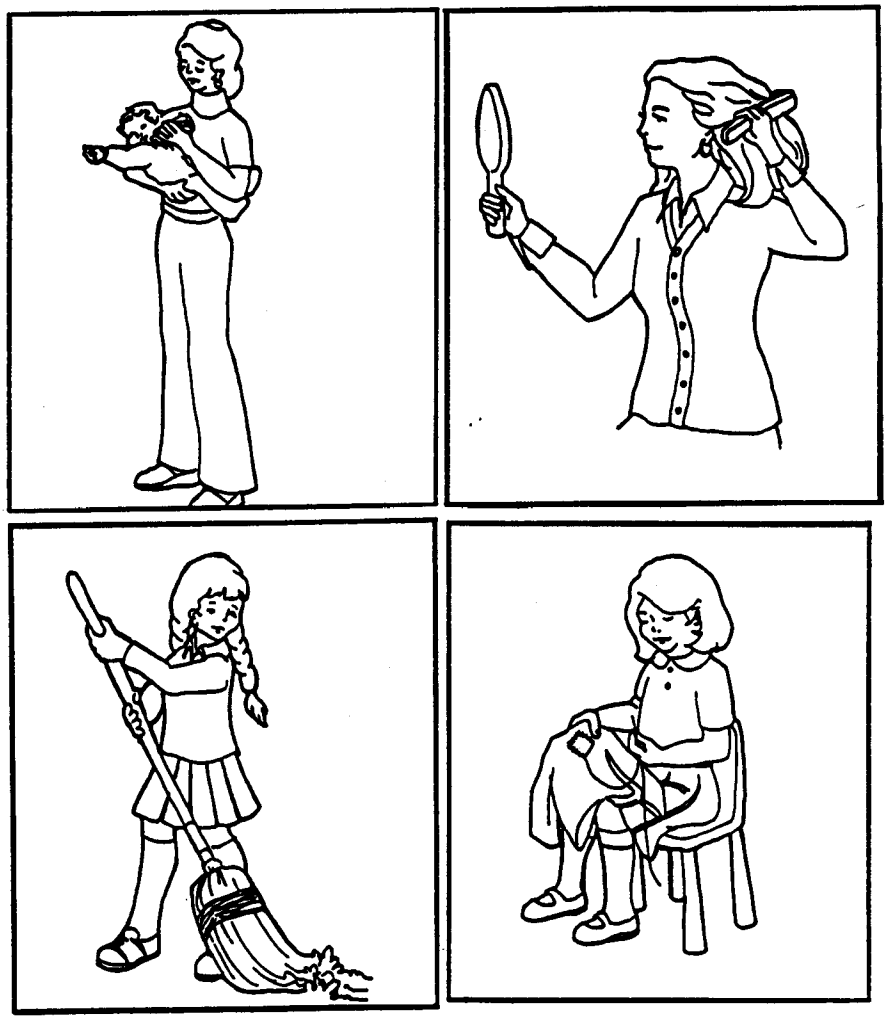
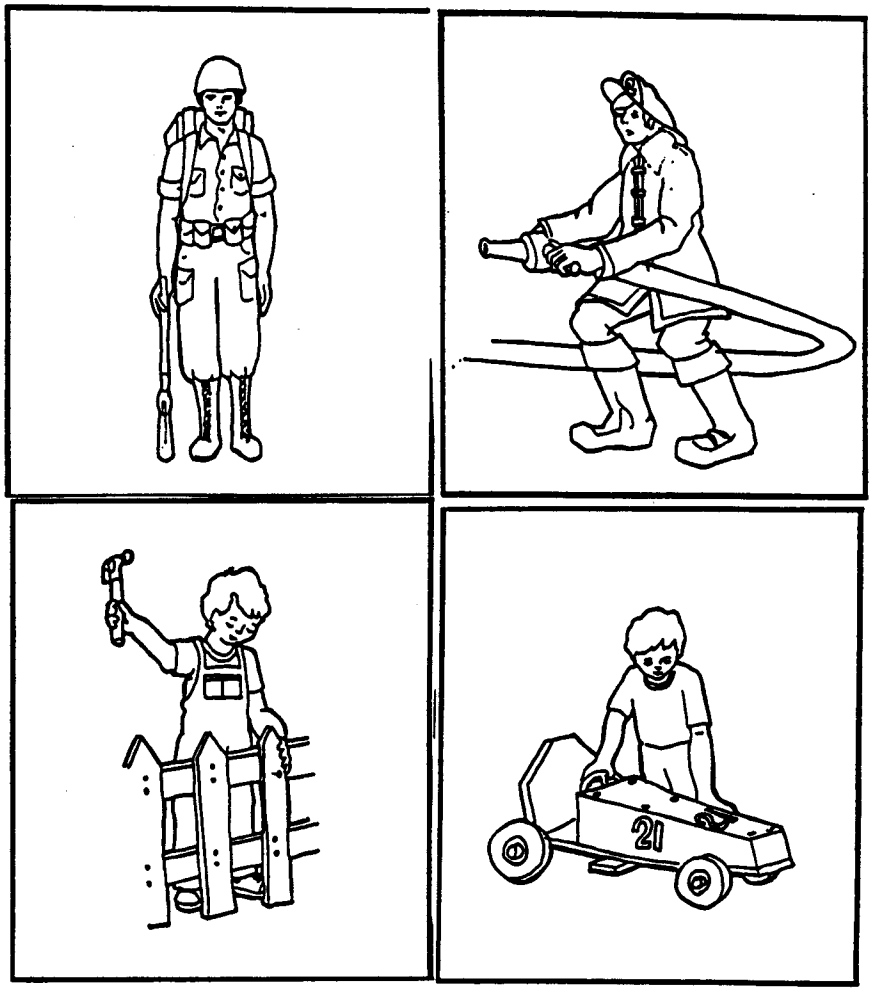


Appendix B

Foil Pictures

Foil Pictures:
Gender-Consistent Content

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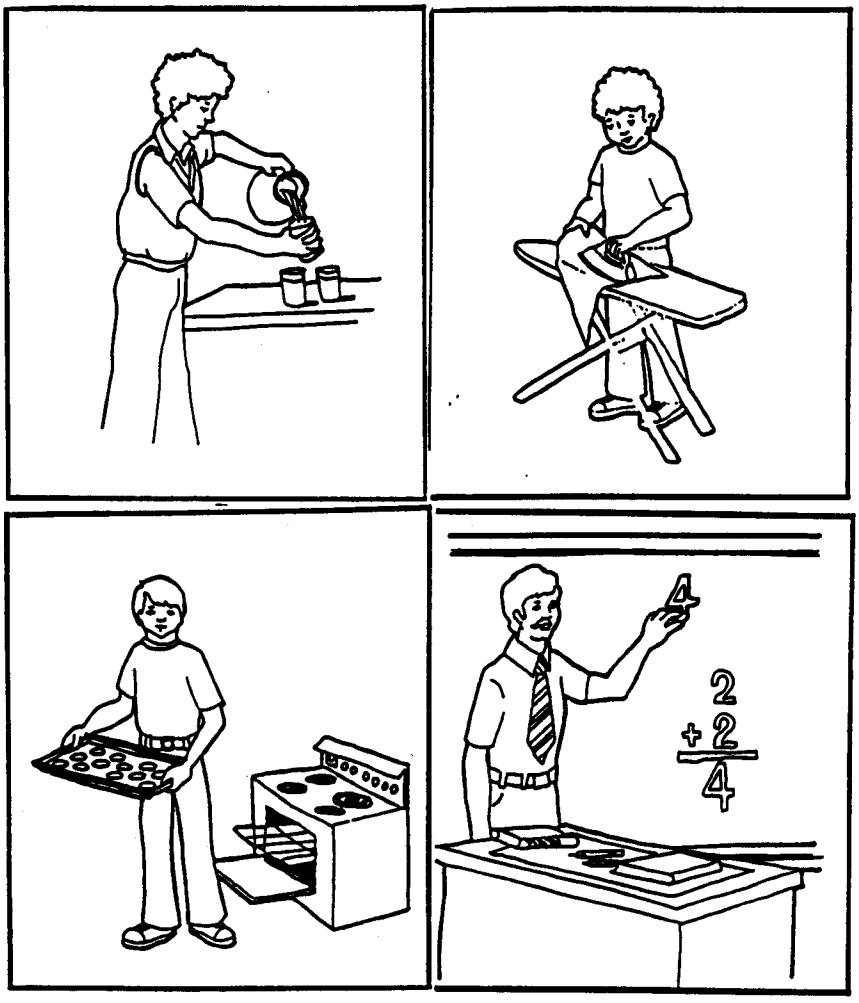
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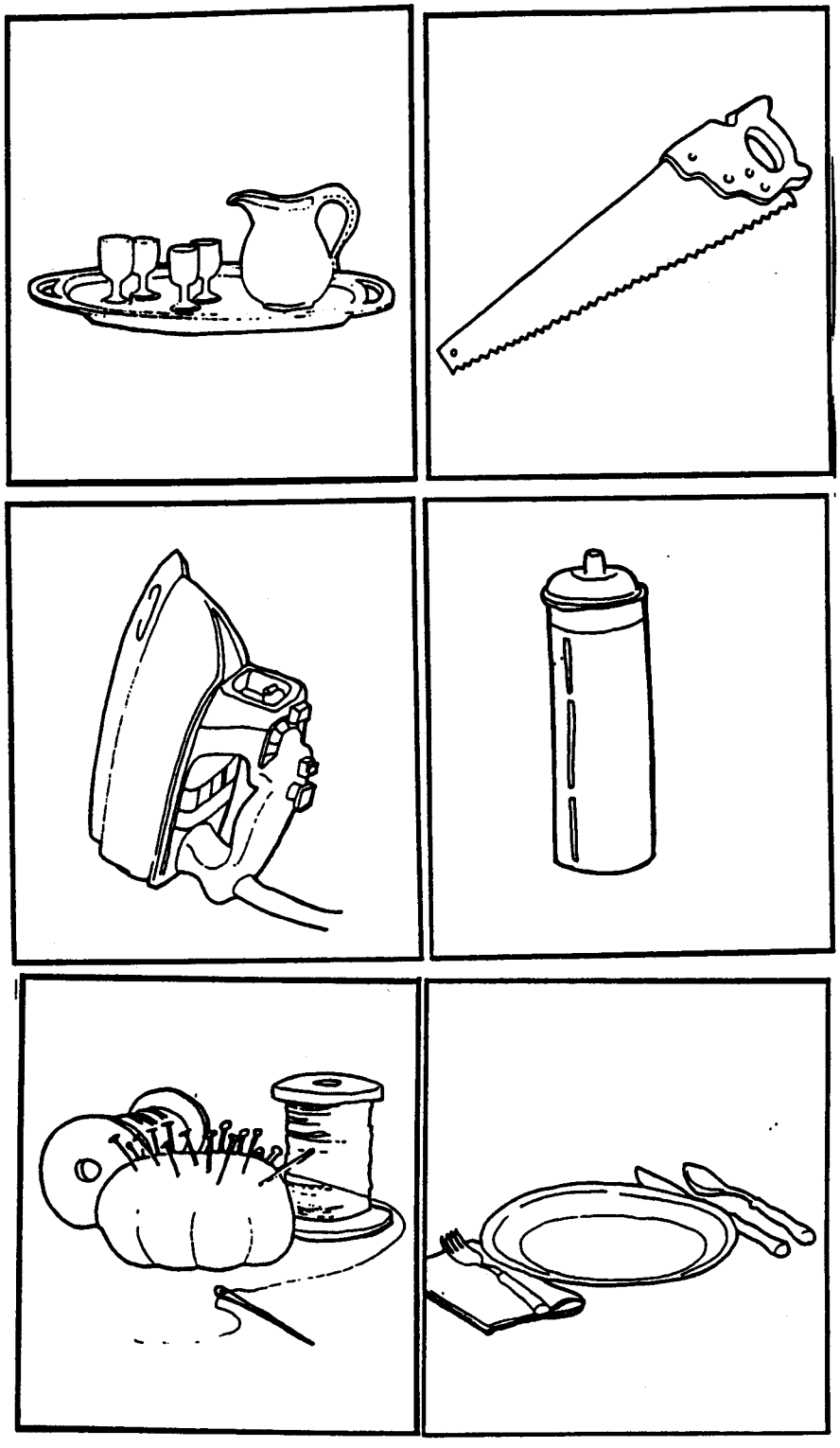
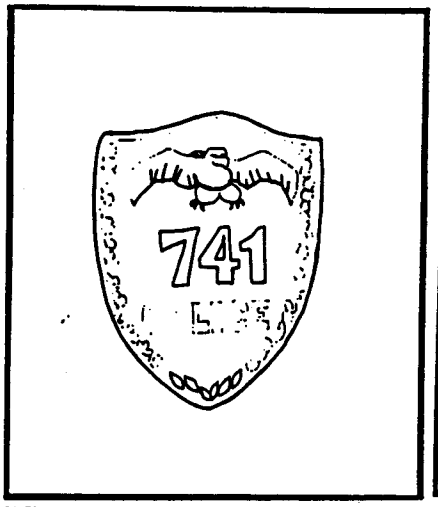
Appendix C

Stimuli for Schemasticity Testing

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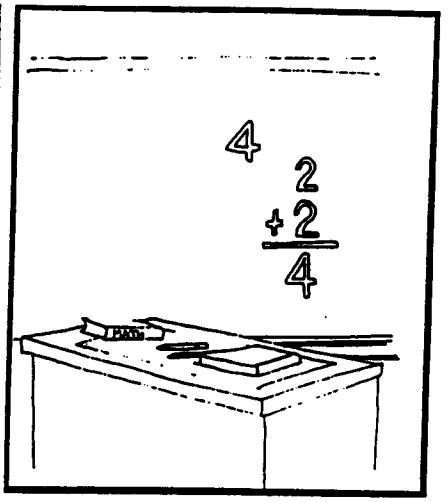
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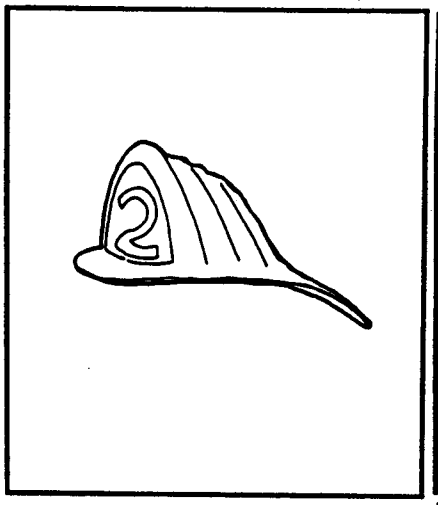
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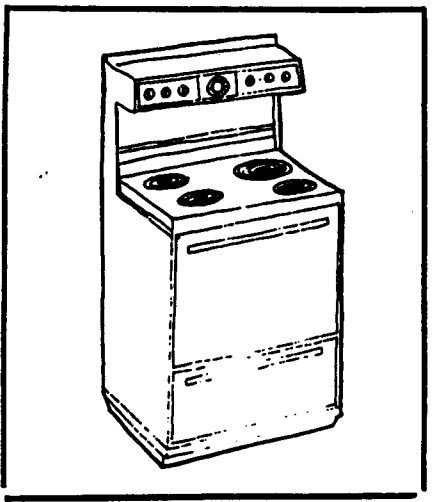

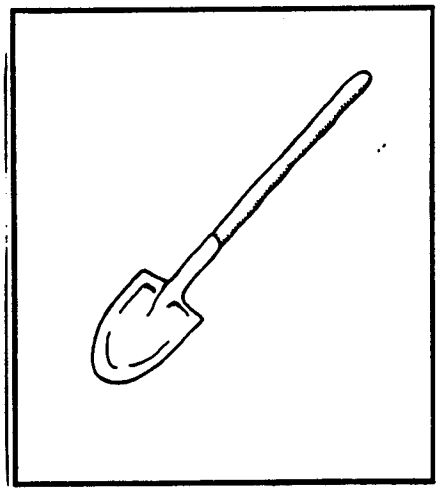

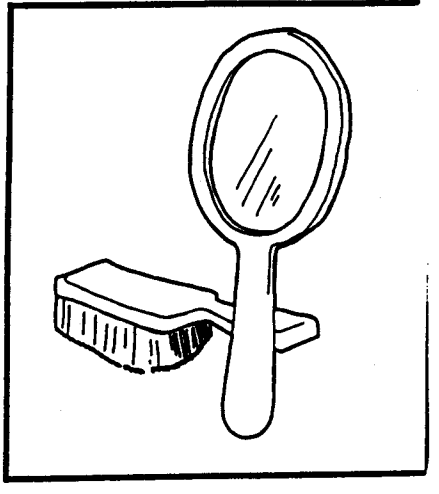

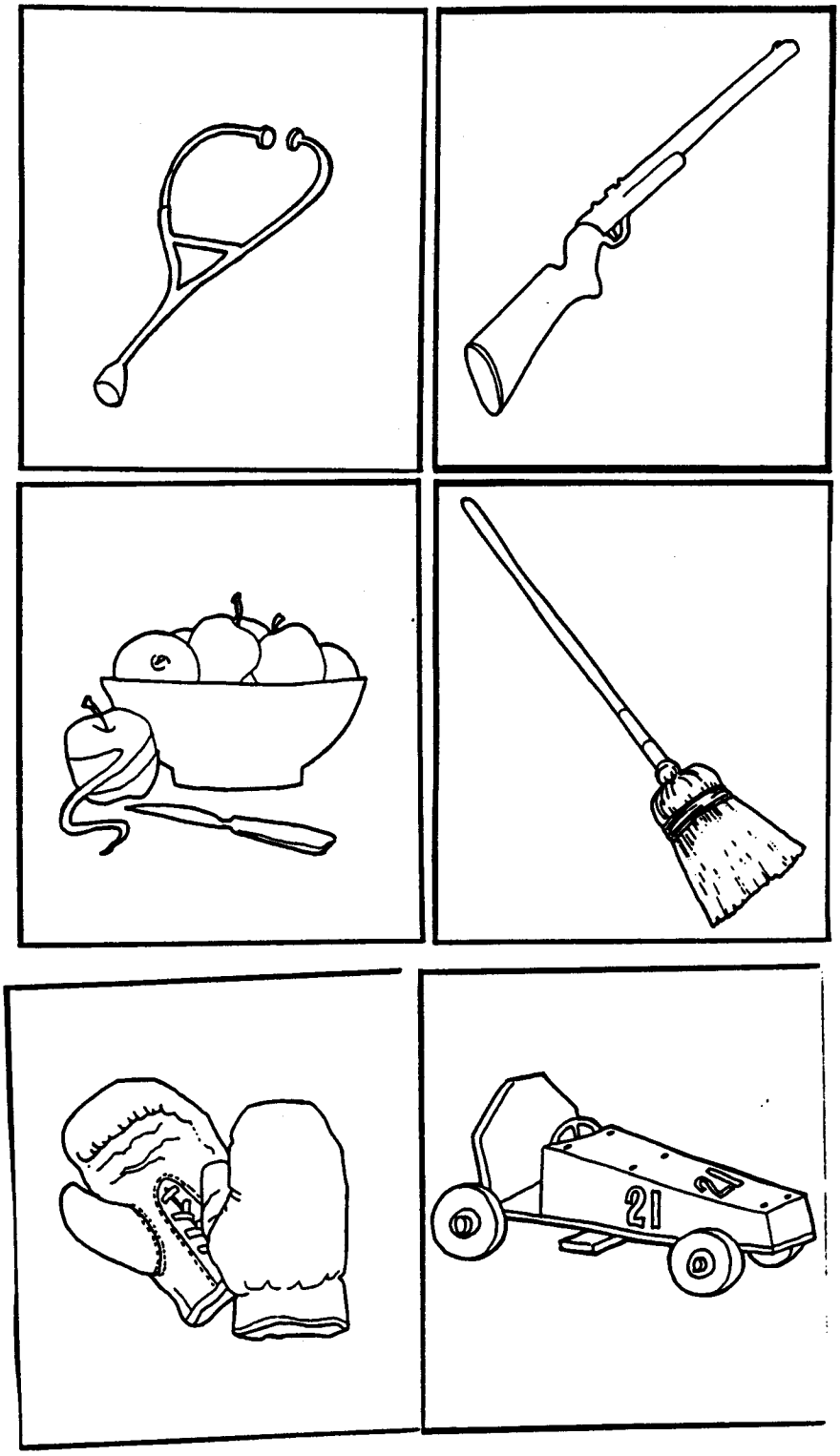
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